WHAT IS CLAIMED:

1. A catheter temperature sensor comprising:

a lumen,

a fiber-optic cable that extends through the lumen, the fiber-optic cable comprising a distal end coated with a fluorescent material and a proximal end connected to a console,

the console comprising a light source for transmitting light through the fiber-optic cable and exciting the fluorescent material, the console further comprising means for generating a temperature signal from the light emitted by the excited fluorescent material.

2. The sensor of claim 1 wherein the means for generating comprises:

a photo multiplier tube for converting light emitted by the excited fluorescent material to a plurality analogue voltage signals,

a digital oscilloscope linked to the photo multiplier tube for converting the plurality of analogue voltage signals to at least on digital signal,

a processor linked to the digital oscilloscope for converting the at least one digital signal to a temperature at the distal end of the fiber-optic cable.

3. The sensor of claim 2 wherein the light source further excites the fluorescent material for a first time period and the stops the excitation, after the excitation stops, the intensity of the light emitted by the excited fluorescent material decays as a function of temperature resulting in changes in the analogue voltage signals generated by the photo multiplier tube.

4. The sensor of claim 3 wherein the processor comprises a memory comprising at least one table for correlating the at least one digital signal to the temperature of the distal end of the fiber-optic cable.

5. The sensor of claim 1 wherein the light source is a laser.

6. The sensor of claim 1 wherein the light source is a nitrogen laser.

7. The sensor of claim 2 further comprising a beam splitter disposed at the proximal end of the fiber-optic cable, the beam splitter being linked to the light source and the photo multiplier tube for transmitting light from the light source to the fiber-optic cable and for transmitting light emitted by the excited fluorescent material from the fiber-optic cable to the photo multiplier tube.

8. The sensor of claim 1 further comprising a trigger delay generator linked to the light source.

9. The sensor of claim 2 further comprising a filter disposed between the proximal end of the fiber-optic cable and the photo multiplier tube.

10. The sensor of claim 2 further comprising a band space filter disposed between the proximal end of the fiber-optic cable and the photo multiplier tube.

11. The sensor of claim 1 wherein the fluorescent material comprises magnesium fluorogermanate.

12. The sensor of claim 1 wherein the fluorescent material comprises magnesium fluorogermanate doped with manganese.

13. The sensor of claim 1 wherein the fluorescent material comprises lanthanum oxysulfide.

14. The sensor of claim 1 wherein the fluorescent material comprises lanthanum oxysulfide doped with europium.

15. The sensor of claim 1 wherein the fluorescent material comprises a doped phosphor.

16. The sensor of claim 1 wherein the lumen comprises a distal end section that at least partially surrounds the distal end of the fiber-optic cable, at least a portion of the distal end section of the lumen being received coaxially in a coil spring.

17. The sensor of claim 16 wherein the lumen further comprises an open distal tip and the coil spring comprises a distal end, the open distal tip of the lumen being connected to and sealed by a weld ball, the weld ball being connected to the distal end of the coil spring.

18. The sensor of claim 17 wherein the coil spring further comprises a proximal end that is welded to an outer surface of the lumen.

19. The sensor of claim 16 wherein the distal end section of the lumen further comprises at least one opening disposed adjacent to the distal end of the fiber-optic cable.

20. The sensor of claim 1 wherein the lumen comprises a distal end, the distal end of the fiber-optic cable extending beyond and out through the distal end section of the lumen.

21. The sensor of claim 20 wherein the lumen is connected to a second lumen which receives a guide wire.

22. The sensor of claim 21 wherein the lumen is connected to the second lumen with shrink wrap.

23. The sensor of claim 21 wherein the lumen passes through the second lumen.

24. The sensor of claim 1 further comprising a guide wire passing through the lumen, and

a plurality of fiber-optic cables annularly spaced between the guide wire and the lumen,

each fiber-optic cable comprising a distal end coated with a fluorescent material and a proximal end connected to the console,

the lumen being retractable with respect to the guide wire and the fiber-optic cables, the fiber-optic cables being biased radially outwardly from the guide wire so that when the lumen is retracted, the distal end of the at least one fiber-optic cable will move away from the guide wire.

25. The sensor of claim 1 further comprising a balloon catheter passing through the lumen, and

a plurality of fiber-optic cables annularly spaced between the balloon catheter and the lumen,

each fiber-optic cable comprising a distal end coated with a fluorescent material and a proximal end connected to the console,

the balloon catheter comprising a distal end connected to a balloon, the distal ends of the fiber-optic cables being coupled to the balloon,

the lumen being retractable with respect to the balloon catheter and the fiber-optic cables.

26. The sensor of claim 1 wherein the lumen comprises a compressible section allowing the lumen to assume a retracted position and an extended position, the distal end section of the lumen further comprising a side opening, the distal end of the fiber-optic cable being aligned with the side opening and extending through the side opening when the lumen is in the retracted position, the distal end of the fiber-optic cable being disposed within the lumen when the lumen is in the extended position.

27. The sensor of claim 26 further comprising a plurality of fiber-optic cables, each fiber-optic cable comprising a distal end coated with fluorescent material, the distal end of lumen comprising a plurality of side openings including one opening for each fiber-optic cable, each fiber-optic cable being aligned with one of the side openings in the lumen.

28. The sensor of claim 27 further comprising a conical insert disposed within the lumen for guiding the fiber-optic cables through the side openings in the lumen as the lumen is moved between the extended and retracted positions.

29. The sensor of claim 1 wherein the distal end section of the lumen further comprises a side opening, the distal end of the fiber-optic cable extending through the side opening, the lumen passing through a retractable sheath, the sheath covering the distal end of the fiber-optic cable, upon retraction of the sheath, the distal end of the fiber-optic cable being biased radially outwardly.

30. The sensor of claim 29 wherein the distal end section of the lumen further comprises a plurality of side openings and the sensor comprises a plurality of fiber-optic cables each having a distal end coated with fluorescent material, the distal end of each fiber-optic cable extending through one of the side openings, upon retraction of the sheath, the distal ends of each fiber-optic cable being biased radially outwardly.

31. The sensor of claim 1 wherein the distal end section of the lumen further comprises a side opening, the distal end of the fiber-optic cable extending through the side opening.

32. The sensor of claim 31 wherein an exterior surface of the lumen comprises a groove for accommodating the distal end of the fiber-optic cable.

33. The sensor of claim 1 further comprising a plurality of fiber-optic cables and the lumen comprises a plurality of side openings and grooves, each groove extending distally along the exterior surface of the lumen from one of the side openings, each distal end of each fiber-optic cable extending through one of the side openings and being accommodated in one of the grooves.

34. A catheter temperature sensor comprising:

a lumen,

a fiber-optic cable that extends through the lumen, the fiber-optic cable comprising a distal end coated with a fluorescent material and a proximal end connected to a console,

the lumen comprising a distal end section that at least partially surrounds the distal end of the fiber-optic cable, a portion of the distal end section being axially received in a coil spring.

35. A catheter temperature sensor comprising:

a lumen,

a fiber-optic cable that extends through the lumen, the fiber-optic cable comprising a distal end coated with a fluorescent material and a proximal end connected to a console,

the lumen being connected to a second lumen which receives a guide wire.

36. A catheter temperature sensor comprising:

a lumen,

a fiber-optic cable that extends through the lumen, the fiber-optic cable comprising a distal end connected to a reflecting surface and a proximal end connected to a console,

the lumen being connected to a balloon, the balloon surrounding the distal end of the fiber-optic cable and the reflecting surface, the balloon comprising an interior surface at least partially coated with fluorescent material,

the console comprising a light source for transmitting light through the fiber-optic cable to the distal end thereof, the reflecting surface for reflecting light transmitted through the fiber-optic cable to the interior surface of the balloon thereby exciting the fluorescent material coated thereon and causing fluoresced light to be transmitted back from the interior surface of the balloon to the reflecting surface, through fiber-optic cable to the console, the console measuring a lifetime of the fluoresced light and converting the lifetime to a temperature of the balloon.

37. A catheter temperature sensor comprising:

a lumen,

a guide wire passing through the lumen,

at least one fiber-optic cable annularly spaced between the guide wire and the lumen,

the at least one fiber-optic cable comprising a distal end coated with a fluorescent material and a proximal end connected to a console,

the lumen being retractable with respect to the guide wire and the at least one fiber-optic cable, the at least one fiber-optic cable being biased radially outwardly from the guide wire so that when the lumen is retracted, the distal end of the at least one fiber-optic cable will move away from the guide wire,

the console comprising a light source for transmitting light through the distal end of the at least one fiber-optic cable thereby exciting the fluorescent material and causing fluoresced light to be transmitted back through the at least one fiber-optic cable to the console, the console measuring a lifetime of the fluoresced light from the distal end of the at least one fiber-optic cable and converting the lifetime to a temperature of the distal end of the at least one fiber-optic cable.

38. The sensor of claim 37 wherein the at least one fiber-optic cable comprises a plurality of fiber-optic cables spaced around the guide wire and between the guide wire and the lumen,

each fiber-optic cable comprising a distal end coated with a fluorescent material and a proximal end connected to the console,

the lumen being retractable with respect to the guide wire and each fiber-optic cable, each fiber-optic cable being biased radially outwardly from the guide wire so that when the lumen is retracted, the distal ends of each fiber-optic cable will move radially away from guide wire,

the console comprising a light source for transmitting light through the distal ends of each fiber-optic cable thereby exciting the fluorescent material at each distal end and causing fluoresced light to be transmitted back through each fiber-optic cable to the console, the console measuring a lifetime of the fluoresced light for each distal end of each fiber-optic cable and converting each lifetime to a temperature for each distal end of each fiber-optic cable.

39. A catheter temperature sensor comprising:

a lumen comprising a distal end connected to a balloon, the lumen further comprising an outer surface, the balloon comprising an outer surface,

at least one fiber-optic cable extending along the outer surface of the lumen and comprising a distal end disposed on the outer surface of the balloon,

the distal end of the at least one fiber-optic cable being coated with a fluorescent material, the at least one fiber-optic cable further comprising a proximal end connected to a console,

the console comprising a light source for transmitting light through the distal end of the at least one fiber-optic cable thereby exciting the fluorescent material and causing fluoresced light to be transmitted back through the at least one fiber-optic cable to the console, the console measuring a lifetime of the fluoresced light from the distal end of the at least one fiber-optic cable and converting the lifetime to a temperature of the distal end of the at least one fiber-optic cable.

40. The sensor of claim 39 wherein the at least one fiber-optic cable comprises a plurality of fiber-optic cables spaced around the outer surfaces of the lumen and balloon,

each fiber-optic cable comprising a distal end coated with a fluorescent material and a proximal end connected to the console,

the console comprising a light source for transmitting light through the distal ends of each fiber-optic cable thereby exciting the fluorescent material at each distal end and causing fluoresced light to be transmitted back through each fiber-optic cable to the console, the console measuring a lifetime of the fluoresced light for each distal end of each fiber-optic cable and converting each lifetime to a temperature for each distal end of each fiber-optic cable.

41. A catheter temperature sensor comprising:

a lumen,

a fiber-optic cable that extends through the lumen, the fiber-optic cable comprising a distal end coated with a fluorescent material and a proximal end connected to a console,

the lumen comprising a distal end section that at least partially surrounds the distal end of the fiber-optic cable, a portion of the distal end section being axially received in a coil spring,

the distal end section of the lumen further comprising a plurality of slits disposed adjacent to the distal end of the fiber-optic cable.

42. A catheter temperature sensor comprising:

a lumen,

a fiber-optic cable that extends through the lumen, the fiber-optic cable comprising a distal end coated with a fluorescent material and a proximal end connected to a console,

the lumen comprising a distal end section that at least partially surrounds the distal end of the fiber-optic cable, a portion of the distal end section being axially received in a coil spring,

the lumen further comprising a compressible section allowing the lumen to assume a retracted position and an extended position, the distal end section of the lumen further comprising a side opening, the distal end of the fiber-optic cable being aligned with the side opening and extending through the side opening when the lumen is in the retracted position, the distal end of the fiber-optic cable being disposed within the lumen when the lumen is in the extended position.

43. The sensor of claim 42 further comprising a plurality of fiber-optic cables, each fiber-optic cable comprising a distal end coated with fluorescent material, the distal end of lumen comprising a plurality of side openings including one opening for each fiber-optic cable, each fiber-optic cable being aligned with one of the side openings in the lumen.

44. The sensor of claim 43 further comprising a conical insert disposed within the lumen for guiding the fiber-optic cables through the side openings in the lumen as the lumen is moved between the extended and retracted positions.

45. A catheter temperature sensor comprising:

a lumen,

a fiber-optic cable that extends through the lumen, the fiber-optic cable comprising a distal end coated with a fluorescent material and a proximal end connected to a console,

the lumen comprising a distal end section that at least partially surrounds the distal end of the fiber-optic cable, a portion of the distal end section being axially received in a coil spring,

the distal end section of the lumen further comprising a side opening, the distal end of the fiber-optic cable extending through the side opening, the lumen passing through a retractable sheath, the sheath covering the distal end of the fiber-optic cable, upon retraction of the sheath, the distal end of the fiber-optic cable being biased radially outwardly.

46. The sensor of claim 45 wherein the distal end section of the lumen further comprises a plurality of side openings and the sensor comprises a plurality of fiber-optic cables each having a distal end coated with fluorescent material, the distal end of each fiber-optic cable extending through one of the side openings, upon retraction of the sheath, the distal ends of each fiber-optic cable being biased radially outwardly.

47. A catheter temperature sensor comprising:

a lumen,

a fiber-optic cable that extends through the lumen, the fiber-optic cable comprising a distal end coated with a fluorescent material and a proximal end connected to a console,

the lumen comprising a distal end section that at least partially surrounds the distal end of the fiber-optic cable, a portion of the distal end section being axially received in a coil spring,

the distal end section of the lumen further comprises a side opening, the distal end of the fiber-optic cable extending through the side opening, an exterior surface of the lumen comprises a groove for accommodating the distal end of the fiber-optic cable.

48. The sensor of claim 47 further comprising a plurality of fiber-optic cables and the lumen comprises a plurality of side openings and grooves, each groove extending distally along the exterior surface of the lumen from one of the side openings, each distal end of each fiber-optic cable extending through one of the side openings and being accommodated in one of the grooves.

49. A method for locating inflamed plaque in an artery, the method comprising:

providing a catheter, the catheter comprising a lumen, a fiber-optic cable that extends through the lumen, the fiber-optic cable comprising a distal end coated with a fluorescent material and a proximal end,

inserting the catheter into the artery;

for a first predetermined time period, transmitting light through the fiber-optic cable to the fluorescent material thereby exciting the fluorescent material and causing it to fluoresce;

stopping the transmission of light through the fiber-optic cable;

for a second predetermined time period, receiving fluoresced light emitted by the excited fluorescent material through the fiber-optic cable at the proximal end of the fiber-optic cable;

determining a lifetime for the fluoresced light received during the second predetermined time period;

converting the lifetime to a temperature value for the artery at the location of the distal end of the catheter.

50. The method of claim 49 further comprising moving the catheter through the artery and repeating the steps of claim 49 for a plurality of locations in the artery to provide a temperature profile along the artery.

51. The method of claim 49 further comprising rotating the catheter and repeating the steps of claim 49 to provide a circumferential temperature profile at a location along the artery.